

Claims

1. A protective cosmetic particulate gel delivery system for a topically applied active agent comprising discrete gel particles formed of an agar gel and further comprising a restraining polymer dispersed in the agar gel, the restraining polymer having sufficient molecular weight to prevent egress of the restraining polymer from the agar gel, having retention groups to bind the active agent to the restraining polymer for retention in the gel particles and being present in a proportion sufficient to deliver an effective amount of the active agent wherein the gel particles are manually crushable on the skin to increase the surface area of the gel particle material and expose the restraining polymer to the skin or other body surface for release of the active agent.

2. A cosmetic particulate gel delivery system according to claim 1 comprising active agent molecules bound to the restraining polymer retention groups wherein the restraining polymer has an average molecular weight of at least 100,000 daltons.

3. A cosmetic particulate gel delivery system according to claim 2 wherein the active agent and the retention groups both comprise polar groups and are of opposite polarity whereby the active agent can bind ionically with the retention groups.

4. A cosmetic particulate gel delivery system according to claim 4 wherein the restraining polymer is a water-soluble modified polysaccharide and the retention groups are quaternary ammonium substituent groups.

5. A cosmetic particulate gel delivery system according to claim 1 wherein the active agent and the retention groups both comprise lipophilic groups whereby the active agent can bind lipophilically to the retention groups.

1 6. A cosmetic particulate gel delivery system according to claim 1 wherein the
2 restraining polymer is selected from the group consisting of polyquaternium 24,
3 laurdimonium hydroxyethylcellulose, cocodimonium hydroxyethylcellulose,
4 steardimonium hydroxyethylcellulose and mixtures thereof.

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6 7. A cosmetic particulate gel delivery system according to claim 1 wherein the
7 active agent is selected from the group consisting of antioxidants, botanically
8 derived polyphenols, procyanidin oligomers, free radical scavengers, topically
9 active enzymes, antibacterials, glucose oxidase, antioxidants, superoxide
10 dismutase, proteolytic enzymes, bromelain, DNA repair enzymes, exfoliative
11 retinoids, retinol, retinol esters, retinol acetate, vitamin A palmitate, purified
12 plant extracts, plant proteins, whitening agents, arbutin, essential fatty acids,
13 linoleic acid, linolenic acid, arachidonic acid, animal proteins, collagen, elastin,
14 keratin, moisturizers, hyaluronic acid, glycosaminoglycans, ultraviolet light
15 filters, ultraviolet light absorbents, coated and uncoated organic and inorganic
16 pigments, titanium, zinc, and iron oxides, melanin, sepia ink extract, colorants,
17 dyes and perfumes.

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19 8. A protective cosmetic particulate gel delivery system for a topically applied
20 active agent comprising discrete, self-supporting gel particles of from 50 microns
21 to 10 mm average size, substantially insoluble in water at 25 °C and formed of a
22 polymeric gel and further comprising a restraining polymer dispersed in the gel,
23 the restraining polymer having sufficient molecular weight to prevent egress of
24 the restraining polymer from the agar gel, having retention groups to bind the
25 active agent to the restraining polymer for retention in the gel particles and being
26 present in a proportion sufficient to deliver an effective amount of the active
27 agent, wherein the gel particles are manually crushable on the skin to increase
28 the surface area of the gel particle material and expose the restraining polymer to
29 the skin or other body surface for release of the active agent.

- 1 9. A method of preparing agar gel particles comprising the steps of:
- 2 a) dissolving agar in water heated to an elevated temperature sufficient to
- 3 dissolve the agar, in a proportion of agar to water effective to form a gel at
- 4 lower temperatures; and
- 5 b) mechanically dispersing the agar solution in a cold hydrophobic liquid
- 6 immiscible with the agar solution maintained at a temperature below the
- 7 agar gelling point;
- 8 comprising including a water-soluble restraining polymer in the agar solution
- 9 whereby the drops are formed into gel beads incorporating the restraining
- 10 polymer.
- 11
- 12 10. A method according to claim 9 wherein comprising cooling the hot agar
- 13 solution to an intermediate temperature above the gelling point of the agar
- 14 solution prior to performing step b).
- 15
- 16 11. A method according to claim 9 wherein the agar-restraining polymer
- 17 solution is mechanically dispersed in the cold hydrophobic liquid by using a
- 18 rotating agitator.
- 19
- 20 12. A method according to claim 11 comprising selecting the rotation speed of
- 21 the agitator to obtain a desired gel bead size.
- 22
- 23 13. A method according to claim 9 wherein the agar-restraining polymer
- 24 solution is mechanically dispersed in the cold hydrophobic liquid by injection
- 25 through a hollow needle to form drops, the needle having an internal dimension
- 26 selected to provide a desired gel bead size.
- 27
- 28 14. A method according to claim 10 comprising admixing a temperature-
- 29 sensitive active agent with the cooled agar-restraining polymer solution, prior to

1 carrying out step b), whereby the active agent is also incorporated in the gel
2 beads.

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4 15. A method according to claim 9, comprising admixing an active agent in
5 step a) whereby the active agent is incorporated in the gel beads.

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7 16. A sunscreen composition comprising an effective quantity of a DNA
8 repair enzyme incorporated in gel beads formulated with a restraining polymer.

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10 17. A sunscreen composition according to claim 16 further comprising an
11 ultraviolet filtering material, e.g. finely divided metal oxide such as titanium
12 dioxide or zinc oxide and a free radical scavenger, e.g. vitamin E.

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14 18. An anti-actinic cosmetic composition for topical application comprising a
15 filtering agent to screen out undesired radiation and a free-radical scavenger
16 characterized by further comprising a DNA repair enzyme.

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